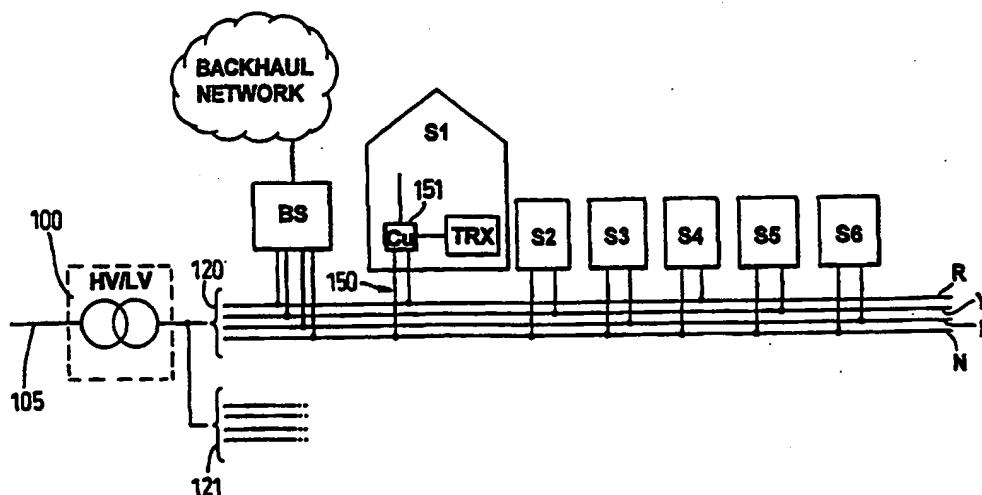




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|   |  |  |  |
|---|--|--|--|
| (51) International Patent Classification <sup>6</sup> :<br><b>H04B 3/54</b>   |  | <b>A3</b>  | (11) International Publication Number: <b>WO 98/57440</b>        |
|   |  |  | (43) International Publication Date: 17 December 1998 (17.12.98) |
| (21) International Application Number: <b>PCT/GB98/01667</b>  |  | (74) Agent: RYAN, John, Peter, William; Nortel Patents, London Road, Harlow, Essex CM17 9NA (GB).  |  |
| (22) International Filing Date: 8 June 1998 (08.06.98)  |  |  |  |
| (30) Priority Data:   |  | (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). |  |
| 08/871,930 10 June 1997 (10.06.97) US<br>9714659.1 11 July 1997 (11.07.97) GB<br>9805765.6 17 March 1998 (17.03.98) GB  |  |  |  |
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| (72) Inventors; and   |  | Published  |  |
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|   |  | (88) Date of publication of the international search report:<br>11 November 1999 (11.11.99)  |  |

(54) Title: DATA TRANSMISSION OVER A POWER LINE COMMUNICATIONS SYSTEM



## (57) Abstract

A power line communications system comprises a power line (120) for distributing electricity to a plurality of premises (S1, S2...) and communication stations (TRX) coupled to the power line at the premises. Data is transmitted to/from stations over the power line using a packet data communications protocol. Apparatus at premises can convert signals between a first protocol, used on the power line, and a second protocol e.g. Ethernet for transferring data to a communications station.

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# INTERNATIONAL SEARCH REPORT

national Application No  
PCT/GB 98/01667

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04B3/54

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | US 4 715 045 A (LEWIS KENNETH A ET AL)<br>22 December 1987 (1987-12-22)   | 1,5-7,<br>10-12       |
| Y          | column 10, line 56 - line 66; figure 4<br><br>figure 3<br>claim 1   | 2-4,8,9,<br>13-18     |
| Y          | WO 95 19070 A (ELCOM TECHNOLOGIES CORP<br>;ABRAHAM CHARLES (US))<br>13 July 1995 (1995-07-13)<br>page 15, line 7 - line 14<br>page 17, line 4 - line 24 | 2-4,<br>13-18         |
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☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

13 August 1999

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| Y          | US 5 245 633 A (MULLER MARC ET AL)<br>14 September 1993 (1993-09-14)<br>abstract<br>column 8, line 55 - line 63<br>column 9, line 23 - line 27<br>column 1, line 13 - line 20<br>--- | 8,9                   |
| A          | WO 95 29537 A (NORWEB PLC ;BROWN PAUL<br>ANTHONY (GB)) 2 November 1995 (1995-11-02)<br>page 3, line 16 - line 26<br>---  | 1-22                  |
| X          | WO 94 03002 A (COMSOURCE SYSTEMS CORP<br>;HILL LAWRENCE WOODBRIDGE (US))<br>3 February 1994 (1994-02-03)<br>abstract   | 23,24,<br>30-32       |
| A          | page 5, line 12 - line 16<br>page 6, line 12 - line 19<br>page 8, line 1 - line 11<br>---  | 59-64                 |
| X          | EP 0 397 535 A (CODEX CORP)<br>14 November 1990 (1990-11-14)   | 23,24,<br>30-33       |
| A          | abstract<br>page 3, line 17 - line 49<br>---   | 59-64                 |
| A          | WO 96 31009 A (CELSAT AMERICA INC)<br>3 October 1996 (1996-10-03)<br>page 7, line 18 - page 8, line 2<br>-----   | 30-32                 |

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 98/01667

3

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

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because they relate to subject matter not required to be searched by this Authority, namely:
  
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3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:  
  
23-33, 59-64
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 98/01667

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-22

Power line communication apparatus which uses a first data packet protocol to carry the transmission on the power line and a second data packet protocol to carry the transmission on the local area network.

2. Claims: 23-33,59-64

Power line transmission apparatus for transmitting data at a certain bit rate which is derived by the channel performances.

3. Claims: 34-38

A method of transmitting data on the power line communications system wherein the data packets are carried in different bands

4. Claims: 34,39-40

A method of transmitting data on the power line communications system by determining a quiet period when noise upon the power line is at a reduced level

5. Claims: 34,41-58

A method of transmitting data on the power line communications system wherein the data packet communications protocol is polling or CSMA or token bus

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)   | Publication<br>date  |
|---|---------------------|--|--|
| US 4715045 A                              | 22-12-1987          | US 4577333 A<br>EP 0174612 A<br>JP 61084143 A  | 18-03-1986<br>19-03-1986<br>28-04-1986   |
| WO 9519070 A                              | 13-07-1995          | AU 705571 B<br>AU 1563195 A<br>CA 2181041 A<br>EP 0744100 A<br>US 5592482 A<br>US 5625863 A  | 27-05-1999<br>01-08-1995<br>13-07-1995<br>27-11-1996<br>07-01-1997<br>29-04-1997   |
| US 5245633 A                              | 14-09-1993          | FR 2674390 A<br>AT 151213 T<br>DE 69218652 D<br>DE 69218652 T<br>EP 0505223 A<br>ES 2099803 T  | 25-09-1992<br>15-04-1997<br>07-05-1997<br>10-07-1997<br>23-09-1992<br>01-06-1997   |
| WO 9529537 A                              | 02-11-1995          | AU 1638999 A<br>AU 704011 B<br>AU 2262795 A<br>BG 106994 A<br>BR 9507402 A<br>CA 2188271 A<br>CZ 9603058 A<br>EP 0756786 A<br>EP 0913955 A<br>FI 964232 A<br>GB 2302783 A, B<br>GB 2330049 A, B<br>HU 76007 A<br>JP 9512394 T<br>NO 964432 A<br>NZ 284119 A<br>PL 316982 A | 29-04-1999<br>01-04-1999<br>16-11-1995<br>28-11-1997<br>07-10-1997<br>02-11-1995<br>11-06-1997<br>05-02-1997<br>06-05-1999<br>21-10-1996<br>29-01-1997<br>07-04-1999<br>30-06-1997<br>09-12-1997<br>04-12-1996<br>27-04-1998<br>03-03-1997 |
| WO 9403002 A                              | 03-02-1994          | US 5448593 A<br>AU 4781393 A<br>EP 0651925 A   | 05-09-1995<br>14-02-1994<br>10-05-1995   |
| EP 0397535 A                              | 14-11-1990          | US 5048054 A<br>AT 148969 T<br>CA 2012913 A<br>DE 69029914 D<br>DE 69029914 T<br>DK 397535 T<br>ES 2100163 T<br>GR 3023410 T<br>HK 1004586 A<br>JP 2309736 A<br>SG 49716 A   | 10-09-1991<br>15-02-1997<br>12-11-1990<br>27-03-1997<br>21-08-1997<br>18-08-1997<br>16-06-1997<br>29-08-1997<br>27-11-1998<br>25-12-1990<br>15-06-1998   |
| WO 9631009 A                              | 03-10-1996          | EP 0801850 A   | 22-10-1997   |

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